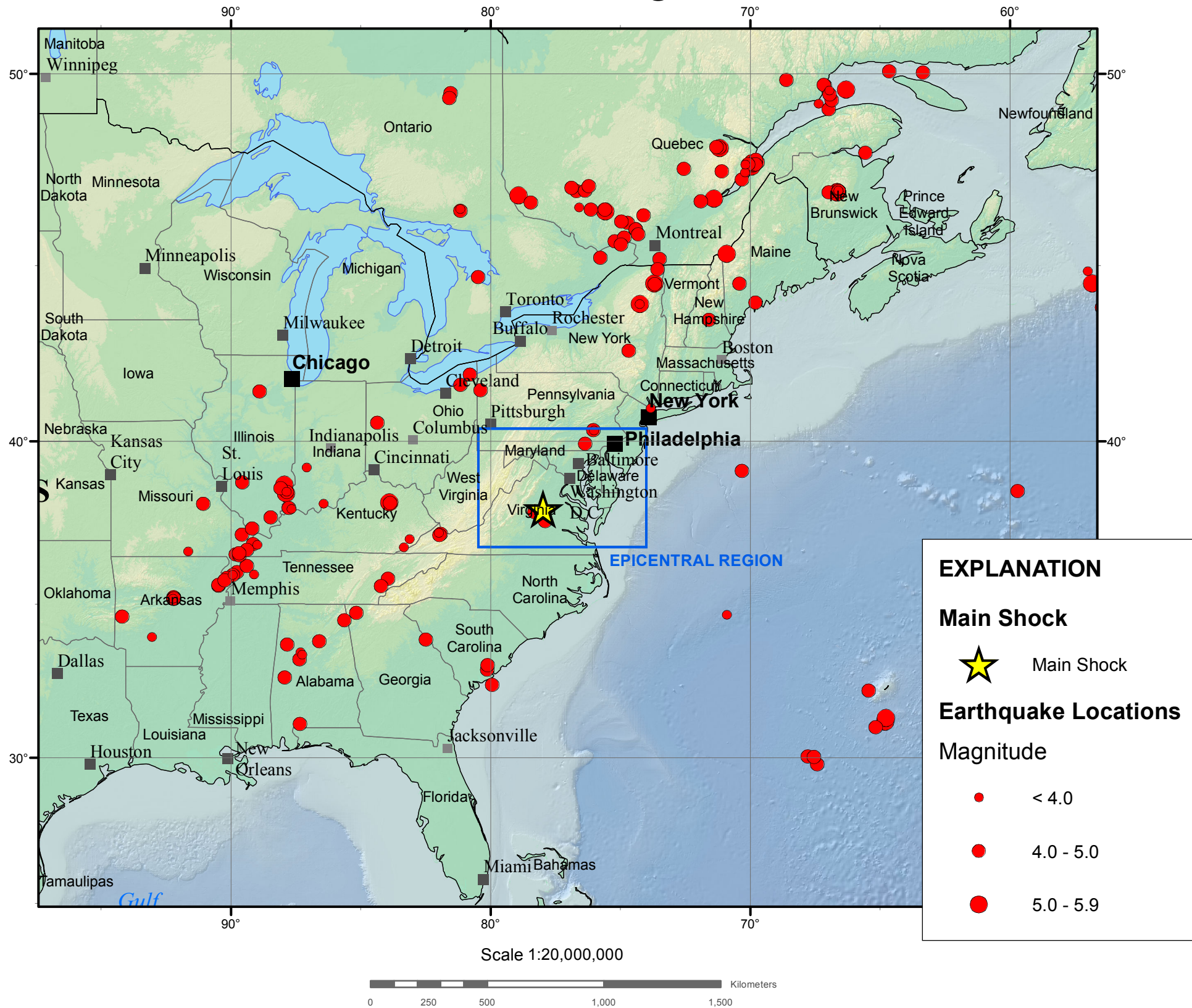


# M5.8 Virginia Region Earthquake of 23 August 2011

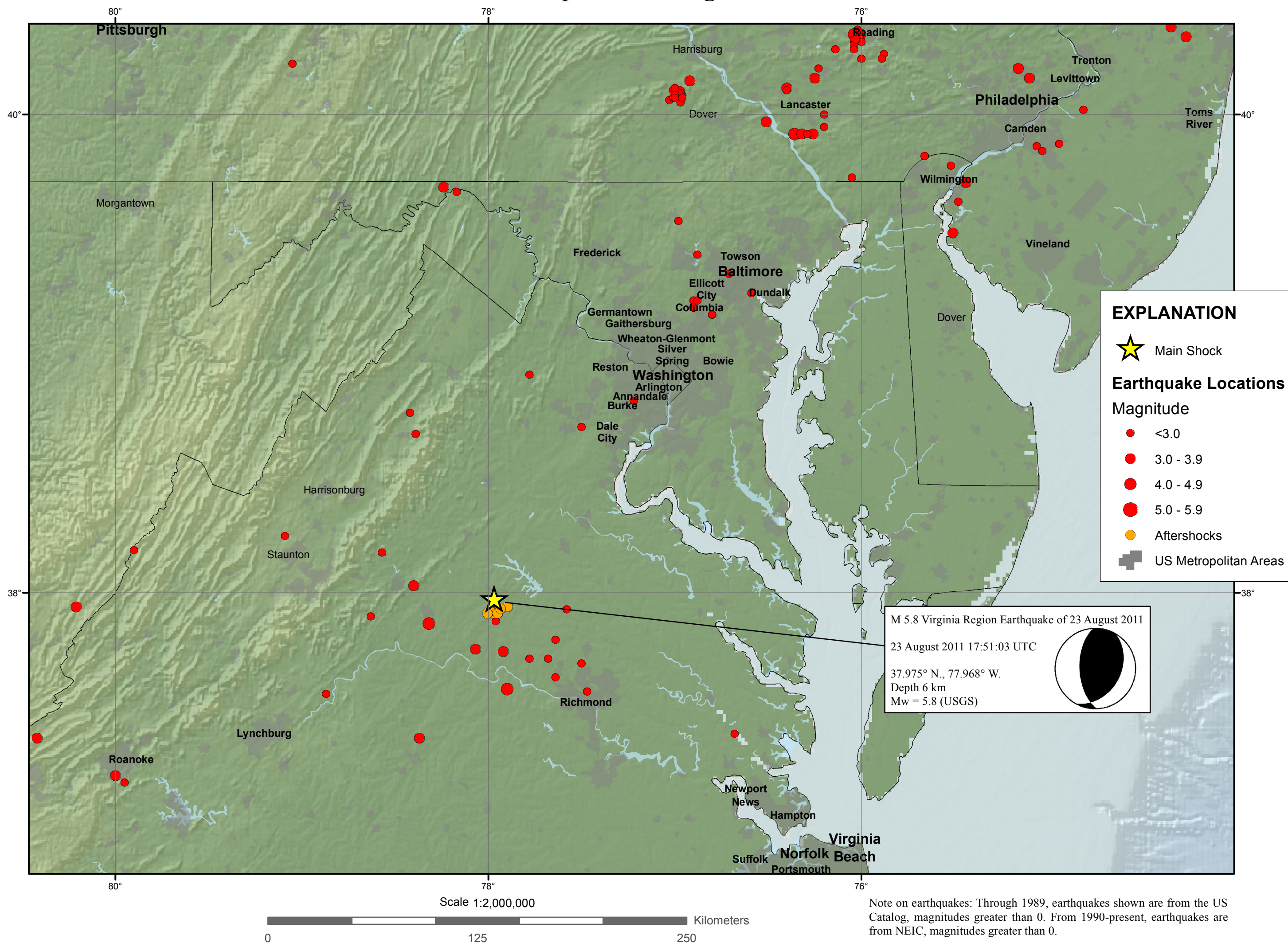


## Tectonic Setting



EXPLANATION	
Main Shock	
★	Main Shock
Earthquake Locations	
Magnitude	
●	< 4.0
●	4.0 - 5.0
●	5.0 - 5.9

## Epicentral Region



EXPLANATION	
★	Main Shock
Earthquake Locations	
Magnitude	
●	<3.0
●	3.0 - 3.9
●	4.0 - 4.9
●	5.0 - 5.9
●	Aftershocks
■	US Metropolitan Areas

M 5.8 Virginia Region Earthquake of 23 August 2011  
23 August 2011 17:51:03 UTC  
37.975° N., 77.968° W.  
Depth 6 km  
Mw = 5.8 (USGS)

## EXPLANATION

★	Main Shock
Earthquake Locations	
Magnitude	
●	<3.0
●	3.0 - 3.9
●	4.0 - 4.9
●	5.0 - 5.9
●	Aftershocks
■	US Metropolitan Areas



M 5.8, VIRGINIA  
Origin Time: Tue 2011-08-23 17:51:04 UTC (13:51:04 local)  
Location: 37.94°N 77.93°W Depth: 6 km

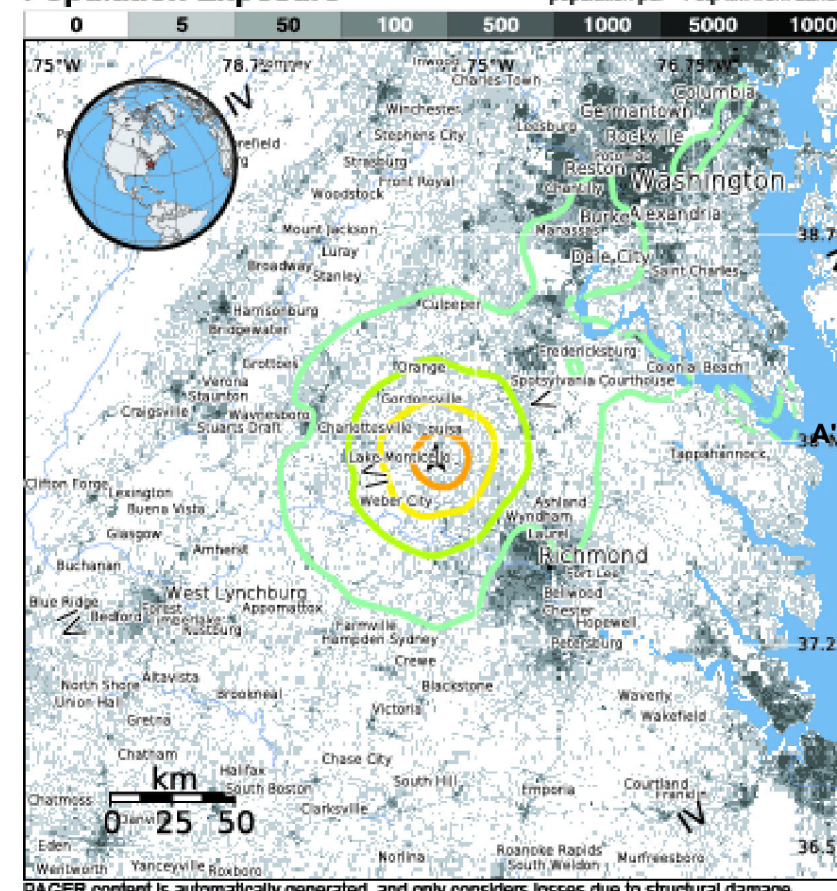
ANSS  
PAGER  
Version 1  
Created: 2 hours, 5 minutes after earthquake



## Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (x1000)	ESTIMATED MODIFIED MERCALLI INTENSITY	PERCEIVED SHAKING	POTENTIAL DAMAGE
19k*	IV	Light	None
76k	V	Moderate	None
23k	VI	Strong	Light
10k	VII	Very Strong	Moderate
0	VIII	Severe	Moderate/Heavy
0	IX	Violent	Heavy
0	X+	Extreme	V. Heavy

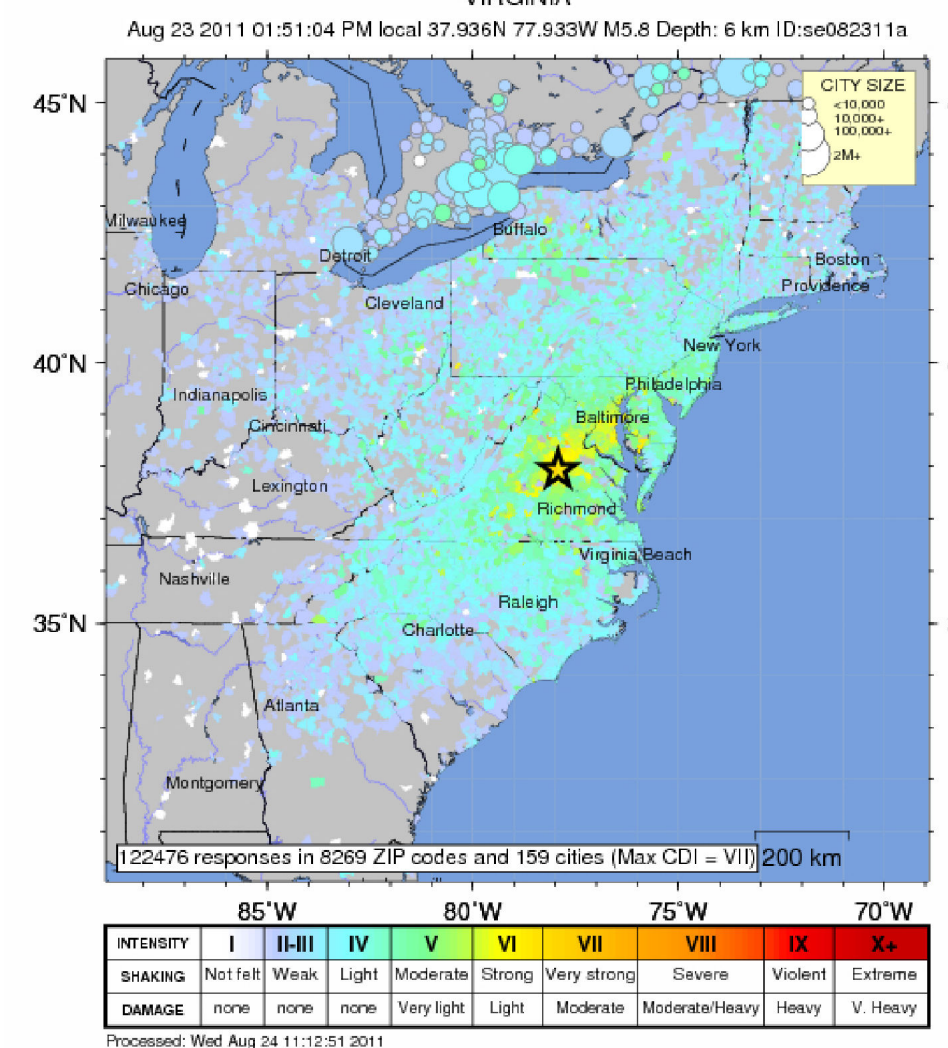
## Population Exposure



Selected City Exposure	
MMI City	Population
VII Louisville	24
VI Gordonsville	24
VI Newington	21
VI Orange	4
VI Weber City	1
VI Lake Monticello	10
V Virginia Beach	425
V Washington	552
IV Richmond	191
IV Baltimore	611
IV Annapolis	38

## Did You Feel It?

USGS Community Internet Intensity Map  
VIRGINIA



## DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD  
USGS, National Earthquake Information Center  
NOAA, National Geophysical Data Center  
HDF (unpublished earthquake catalog) (Engdahl, 2003)  
Global Seismic Hazard Assessment Program

BASE MAP  
NIMA and ESRI, Digital Chart of the World  
USGS, EROS Data Center  
NOAA GEBCO and GLOBE Elevation Models  
ESRI Online

## TECTONIC SUMMARY

The Virginia earthquake of 2011 August 23 occurred as reverse faulting on a north or northeast-striking plane within a previously recognized seismic zone, the "Central Virginia Seismic Zone." The Central Virginia Seismic Zone has produced small and moderate earthquakes since at least the 18th century. The previous largest historical shock from the Central Virginia Seismic Zone occurred in 1875. The 1875 shock occurred before the invention of effective seismographs, but the felt area of the shock suggests that it had a magnitude of about 4.8. The 1875 earthquake shook bricks from chimneys, broke plaster and windows, and overturned furniture at several locations. A magnitude 4.5 earthquake on 2003, December 9, also produced minor damage.

Previous seismicity in the Central Virginia Seismic Zone has not been causally associated with mapped geologic faults. Previous, smaller, instrumentally recorded earthquakes from the Central Virginia Seismic Zone have had shallow focal depths (average depth about 8 km). They have had diverse focal mechanisms and have occurred over an area with length and width of about 120 km, rather than being aligned in a pattern that might suggest that they occurred on a single causative fault. Individual earthquakes within the Central Virginia Seismic Zone occur as the result of slip on faults that are much smaller than the overall dimensions of the zone. The dimensions of the individual fault that produced the 2011 August 23 earthquake will not be known until longer-term studies are done, but other earthquakes of similar magnitude typically involve slippage along fault segments that are 5 – 15 km long.

Earthquakes in the central and eastern U.S., although less frequent than in the western U.S., are typically felt over a much broader region. East of the Rockies, an earthquake can be felt over an area as much as ten times larger than a similar magnitude earthquake on the west coast. A magnitude 4.0 eastern U.S. earthquake typically can be felt at many places as far as 100 km (60 mi) from where it occurred, and it infrequently causes damage near its source. A magnitude 5.5 eastern U.S. earthquake usually can be felt as far as 500 km (300 mi) from where it occurred, and sometimes causes damage as far away as 40 km (25 mi).

## Significant Earthquakes Mag >= 4.0 Since 1973

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1984	04	23	0136	39.921	-76.355	5	4.4
1984	08	17	1805	37.868	-78.324	8	4.2
1994	01	16	0042	40.327	-76.007	5	4.0
1994	01	16	0149	40.33	-76.037	5	4.6
2003	12	09	1854	37.587	-77.903	5	4.5
2011	08	23	1751	37.936	-77.933	6	5.8

## DISCLAIMER

Base map data, such as place names and political boundaries, are the best available but may not be current or may contain inaccuracies and therefore should not be regarded as having official significance.